

SENSOR-TRIGGERED SUCTION TRAP FOR COLLECTING GRAVID MOSQUITOES

TECHNICAL FIELD

This invention relates to method and apparatus for collection of gravid mosquitoes, particularly gravid *Aedes aegypti* mosquitoes. The trap provides a sensor to trigger suction to collect the mosquitoes from a point just above the surface of an oviposition attractant.

BACKGROUND

Ovitrap have been widely used for many years to collect the eggs of container-breeding mosquitoes (Service, M. W. (1976); In *Mosquito Ecology*, John Wiley Inc., New York, pp. 1-42). The CDC Gravid Mosquito Trap is the only published trap for gravid adults, but collects ovipositing *Culex* mosquitoes and operates on a different principle (see Reiter (1983), *Mosquito News* 43 (4): pp. 496-498; and Reiter (1987), *Journal of the American Mosquito Control Association* 3(2): pp. 325-327).

The problem is to collect live, adult *Aedes aegypti*, *Aedes albopictus*, and certain other *Aedes* mosquitoes. *Aedes aegypti* is the principal urban vector of dengue, dengue hemorrhagic fever and yellow fever throughout the tropics. The Yellow Fever Mosquito *Aedes aegypti* is an urbanized species which breeds in or close to human habitation and is the principal urban vector of dengue and yellow fever. In recent years, a massive resurgence of *Aedes aegypti* has resulted in millions of cases of dengue in the Americas, including some in the United States. An effective, efficient device for collecting live *Aedes aegypti* therefore is urgently needed for surveillance and monitoring of vector populations, for virus collections, and for the evaluation of control methods during epidemics.

Aedes albopictus also considered an important vector of dengue. It is an Asian species which recently invaded the United States in used tire shipments and is now common in at least 20 states. Apart for its significance as a vector, it has become a severe nuisance in many cities, such as Houston, New Orleans and Memphis. *Aedes triseriatus* is a common North American species and is the vector of LaCrosse encephalitis. All three species originally bred in tree-holes and other natural cavities, but *Aedes aegypti* (and to a certain extent *Aedes albopictus* and *Aedes triseriatus*) have adopted artificial containers in the domestic environment as their principal oviposition site.

At present, *Aedes aegypti* populations are assessed by highly subjective methods, such as counts of larva-infested sites or aspirator collections inside houses. These are so dependent on the diligence and skill of the field personnel that it is difficult to regard data as quantitative. The prior art includes a number of automated traps using a constant air flow, such as the CDC Gravid Mosquito Trap discussed above. Certain mosquitoes, however, including *Aedes aegypti*, will not fly into strong air currents. This is particularly true when seeking sites for oviposition. Consequently, the constant air flow type traps have proven ineffective for collecting gravid mosquitoes of such species.

One object of the invention therefore is to automatically collect live, adult, gravid *Aedes aegypti* mosquitoes. A non-subjective, automated method for collecting the adult mosquito would be of great value for surveillance, evaluation of control operation and many research purposes, but has never been devised. The

invention seeks to provide such a method by trapping the mosquitoes as they settle to lay their eggs. In addition, it will probably be suitable for collecting other important vector species such as the Asian Tiger Mosquito *Aedes albopictus* and the Eastern Treehole Mosquito *Aedes triseriatus*.

As a further object, the collection device should not produce any substantial air flow or turbulence prior to collection since such air currents deter certain insects from entering the trap.

DISCLOSURE OF THE INVENTION

The instant invention is a trap for collecting insects. In one broad aspect, the inventive trap includes a vessel containing an attractant, a sensor for detecting the presence of an insect at a specific point in the vessel, a collector and transfer means. In response to detection of an insect by the sensor, the transfer means are activated to transfer the detected insect into said collector.

In one preferred aspect of the invention, the sensor is an electronic sensor. Also, the transfer means comprises a fan controlled in response to detection of an insect at the specific point by the electronic sensor. When activated by the sensor, the fan creates an air flow for a prescribed period to transfer the detected insect into the collector.

In the presently preferred embodiment, the sensor comprises an optical infrared transmitter and an optical infrared detector aligned to receive light from said optical transmitter. The optical detector detects the presence of an insect at the specific point by sensing an interruption of the light from the optical transmitter.

In another important aspect, the inventive trap includes a container for an attractant, a sensor for detecting the presence of an insect, a collector and transfer means. In this instance, all surfaces of the container are substantially smooth. A strip of rough material is provided on the container adjacent the surface of the attractant. The sensor is then mounted on the container adjacent the strip. In response to detection of an insect by the sensor, the transfer means are activated to transfer the detected insect into said collector.

In its most detailed structural form, the trap for collecting gravid mosquitos includes a smooth surfaced vessel containing oviposition attractant and a strip of rough material mounted on the vessel and extending above the surface of the oviposition attractant. An infrared transmitter is aligned with an infrared detector adjacent the strip above the surface of the oviposition attractant. A circuit produces a trigger signal in response to detection by the infrared detector of an interruption in the infrared transmission by said infrared transmitter. A fan is coupled to produce an air flow through a suction tube and a collecting tube. The trap further includes a motor driving the fan in response to the trigger signal, such that the air flow produced by said fan draws a mosquito from the strip through the suction tube and into the collecting tube.

In another aspect the invention is a method for collecting insects. The inventive method comprises the steps of attracting an insect to a vessel, automatically detecting the presence of an insect at a specific point in said vessel, and transferring the detected insect into a collector in response to the detection of an insect at said point.

Specifically, *Aedes* mosquitoes searching for an oviposition site are attracted to a dark vessel containing an